We claim:

1   1. A method of forwarding a packet to a destination comprising:

2   examining a header of said packet to determine a private destination address;

3   determining a private address of a private remote sub-endpoint of a tunnel,
4   said private sub-endpoint being associated with said private destination
5   address;

6   determining a public address of a public remote sub-endpoint of said tunnel;

7   encapsulating said packet, resulting in an encapsulated packet, to indicate a
8   public address of a public local sub-endpoint of said tunnel as a source
9   address and said public address of said public remote sub-endpoint of said
10   tunnel as a destination address; and

11   forwarding said encapsulated packet to a node in a carrier network.

2. The method of claim 1 wherein said tunnel is a point to multipoint tunnel.

3. The method of claim 1 wherein said determining said private address of said first
2   remote sub-endpoint of said tunnel comprises consulting a routing table to discover
3   an address associated with said private destination address of said packet.

1   4. The method of claim 6 wherein said determining said public address of said
2   second remote sub-endpoint of said tunnel comprises consulting a static address
3   resolution protocol table to discover an address associated with said private address
4   of said first remote sub-endpoint of said tunnel.

1   5. The method of claim 1 further comprising determining a private address of a first
2   local sub-endpoint of said tunnel.

1   6. The method of claim 5 wherein said determining said private address of said first
2   local sub-endpoint of said tunnel comprises consulting a forwarding table to discover
3   an address associated with said private address of said first remote sub-endpoint of
4   said tunnel.

1   7. A carrier router comprising:

2   a backbone router including:

3   a public network interface for connecting to a public data network; and

4   a sub-endpoint for a tunnel having a network address in an address
5   space of said public data network; and

6   a customer virtual router including:

7   a private network interface for connecting to a private data network;
8   and

9   a sub-endpoint for said tunnel having a network address in an address
10   space of said private data network.

1   8. A carrier router comprising:

2   a private network interface;

3   a public network interface;

4   a processor operable to:

5   receive a packet at said private network interface;

6   examine a header of said packet to determine a private destination
7   address;

8   determine a private address of a private remote sub-endpoint of a
9   tunnel, said private sub-endpoint being associated with said private
10   destination address;

11   determine a public address of a public remote sub-endpoint of said
12   tunnel;

13   encapsulate said packet, resulting in an encapsulated packet, to
14   indicate a public address of a public local sub-endpoint of said tunnel
15   as a source address and said public address of said public remote sub-
16   endpoint of said tunnel as a destination address; and

17   forward said encapsulated packet to a node in a public network via said
18   public network interface.

1   9. A computer readable medium containing computer-executable instructions which,
2   when performed by a processor in a carrier router, cause the processor to:

3   examine a header of said packet to determine a private destination address;

4   determine a private address of a private remote sub-endpoint of a tunnel, said
5   private sub-endpoint being associated with said private destination address;

6   determine a public address of a public remote sub-endpoint of said tunnel;

7   encapsulate said packet, resulting in an encapsulated packet, to indicate a
8   public address of a public local sub-endpoint of said tunnel as a source
9   address and said public address of said public remote sub-endpoint of said
10   tunnel as a destination address; and

11   forward said encapsulated packet to a node in a carrier network.

1   10. A method of receiving a packet, said packet having public source and destination
2   addresses and private source and destination addresses, said method comprising:

3   receiving said packet from a node in a carrier data network;

4   forwarding said packet to a first tunnel sub-endpoint having said public
5   destination address;

6   at said first tunnel sub-endpoint, removing said public source and destination
7   addresses from said packet;

8   forwarding said packet to a second tunnel sub-endpoint; and

9   at said second tunnel sub-endpoint, forwarding said packet to a device having

10   said private destination address.

1   11. A computer readable medium containing computer-executable instructions which,

2   when performed by a processor in a carrier router, cause the processor to:

3   receive said packet from a node in a carrier data network;

4   forward said packet to a first tunnel sub-endpoint having said public

5   destination address;

6   at said first tunnel sub-endpoint, remove said public source and destination

7   addresses from said packet;

8   forward said packet to a second tunnel sub-endpoint; and

9   at said second tunnel sub-endpoint, forward said packet to a device having

10   said private destination address.

1   12. A method of adding a given carrier router to a virtual private network, said virtual

2   private network described by a plurality of tunnel definitions, each of said tunnel

3   definitions defining tunnels between sub-endpoints of existing carrier routers, said

4   method comprising:

5   adding a public network address of a sub-endpoint of said given carrier router

6   as a destination address in each of said plurality of tunnel definitions to create

7   a plurality of amended tunnel definitions; and

8   adding a new tunnel definition where said public network address for said

9   sub-endpoint of said given carrier router is a source address in said new

10   tunnel definition and public network addresses for said sub-endpoints of said

11   existing carrier routers are destination addresses in said new tunnel definition.

1   13. The method of claim 12 further comprising distributing said plurality of amended

2   tunnel definitions and said new tunnel definition to said existing carrier routers and

3   said given carrier router.

1 14. The method of claim 13, where said sub-endpoint of said given carrier router is a
2 first sub-endpoint and said given carrier router has a second sub-endpoint with a
3 private network address, said method further comprising adding an association of
4 said private network address of said second sub-endpoint to said public network
5 address of said first sub-endpoint to an existing Address Resolution Protocol table to
6 give rise to an amended Address Resolution Protocol table.

1 15. The method of claim 14 further comprising distributing said amended Address
2 Resolution Protocol table to said existing carrier routers and said given carrier router.

1 16. A computer readable medium containing computer-executable instructions which,
2 when performed by a processor in a network management console, cause the
3 processor to:

4   add a public network address of a sub-endpoint of a given carrier router as a
5   destination address in each of a plurality of tunnel definitions to create a
6   plurality of amended tunnel definitions; and

7   add a new tunnel definition where a public network address for a sub-endpoint
8   of said given carrier router is a source address in said new tunnel definition
9   and public network addresses for sub-endpoints of said existing carrier
10   routers are destination addresses in said new tunnel definition.